PCI Modem Card
User's Manual

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July 2001. Revision 03

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Chapter 1 Before You Begin

1.1 Features

Thank you for purchase of the internal modem card. Right here we present to you the outstanding modem; an easy way to install, fully plug and play.

These Data/Fax/TAM Modems combine the features of a 56000(receive only)/33600/28800/14400/9600 bps data modem and a 14400/9600 bps FAX modem. Your new Data/Fax/TAM Modem gives your personal computer the ability to send and receive FAX messages over the telephone line like a standard FAX machine. Your Data/Fax/TAM Modem also allows your PC to communicate with other personal computers, terminals or BBS's (Bulletin Board Systems) through the data modem functions.

When used as a data modem your Data/Fax/TAM Modem uses the standard AT command set and is fully compatible with ITU-T V.42, V.42bis, V.34, V.32bis, V.32, V.22bis, V.23, V.22, V.21, MNP 2-5, Bell 103, 212A, K56flex and/or V.90. When used as a Fax Modem it communicates with all ITU-T Group 3 FAX machines and is compatible with ITU-T V.27ter and V.29, V.17. Switching between DATA mode operation and FAX mode operation of your Data/Fax/TAM Modem is done through its resource, no hardware settings are required.

The communication software, which should be used, depends on the kind of machine that you are going to communicate with. If you are going to call a FAX machine then you must use the Fax software. If the machine that you are going to communicate with is a modem then you must use a data modem communications software.

General Modem Features

- V.90 data modem with receive rates up to 56k bps and send rates up to V.34 rates
  - ITU-T V.90, K56flex, V.34, V.32 bis, V.32, V.22 bis, V.22, V.23, and V.21; Bell 212A and 103
  - V.42 and MNP 2-4 error correction
  - V.42 bis and MNP 5 data compression
- V.17 fax modem with send and receive rates up to 14.4 kbps
  - V.17, V.29, V.27 ter, and V.21 ch 2
- Telephony/TAM
  - V.253 commands
  - 8-bit μ-Law/A-Law coding (G.711)

  - 8-bit/16-bit linear coding
  - 8 kHz sample rate
  - Concurrent DTMF, ring, and Caller ID detection
- Data/Fax/TAM call discrimination
- Hardware-based digital signal processing
- Single configuration profile stored in host
- Operates in US/Japan/Canada, etc.
- FCC operation
  - Supports FCC and other countries
  - Caller ID detection
- System compatibilities
  - Windows 95, Windows 98, Windows ME, Windows NT 4.0, Windows 2000 operating systems
  - Pentium 166 MHz equivalent or greater (200 MHz recommended)
  - 16 Mbyte RAM or more
- Thin packages support low profile designs
  - HSD (P9573): 100-pin TQFP (1.2 mm max. height)
  - LSD (20463): 32-pin TQFP (1.6 mm max. height)
- +3.3V operation with +5V tolerant digital inputs

PCI Bus Host Interface Features

- 32-bit PCI Bus host interface
  - Meets PCI Local Bus Specification Rev. 2.1
  - PCI Bus Mastering interface
  - 33 MHz PCI clock support
- Supports Power Management
  - Meets PCI Bus Power Management Spec. Rev. 1.1
  - APM support
  - PME# support (S1 mode only)

SmartDAA Features

- System side powered DAA operates under poor line current supply conditions
- Ring detection
- Line polarity reversal detection
- Line current loss detection

- Line-in-use detection detects even while on-hook
- Remote hang-up detect for efficient call termination
- Extension pickup detect
- Digital PBX line protection

1.2 Package Contents

Before installation, please check the items of your package. The package should include the following items:

- The Internal Modem Card
- Quick Installation
- CD-based software (including drivers for Windows 95 /98/Me /NT/2000)

If any of the above items is missing, contact your supplier as soon as possible.

1.3 Minimum System Requirements

Before installation, please check the following requirements with your equipment.

- Pentium 166 MHz equivalent or greater (200MHz recommended)
- CD-ROM drive
- One available PCI slot
- 16 Mbyte RAM or more
- Windows 95 / 98 / Me/ NT /2000 with TCP/IP protocol

Chapter 2 Hardware Installation

SAFETY PRECAUTION: Only use the accessories and connection cables attached with the modem package. Otherwise, the modem may not function. If you miss or damage the accessories or connection cables, please contact your local dealer.

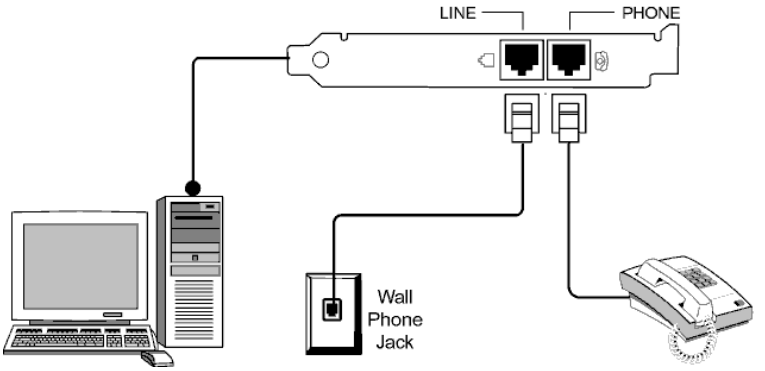
2.1 Installation the Card

1. With the power to your PC disconnected, remove the PC's casing.
2. Press the modem card firmly into the PCI slot, and secure it with screws to your PC.
3. Reinstall the casing on your PC.

2.2 Connection

1. Plug one end of the phone cord into LINE jack and the other end to the analog phone jack.
2. When you are not using the modem, you can use a telephone on the modem's phone line. Plug your telephone's cord into the modem's PHONE jack.

The figure below illustrates the typical connection of internal modem card.

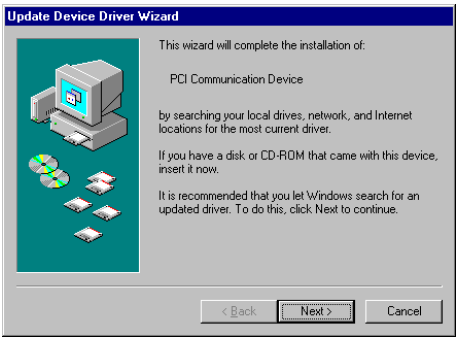


Chapter 3 Software Installation

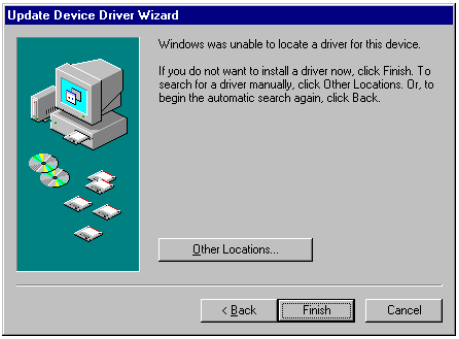
After hardware installation, power on your PC and follow the instructions to install the drivers for the PCI modem card.

3.1 Software Installation for Windows 95

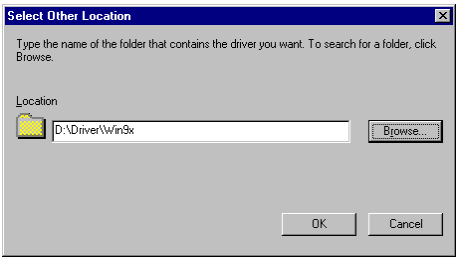
1. After installing the modem card into your PC, power on your PC and start Windows 95. Your computer detects new hardware and displays the **Update Device Driver Wizard** window. Click **Next**.


Update Device Driver Wizard
This wizard will complete the installation of:
PCI Communication Device
by searching your local drives, network, and Internet locations for the most current driver.
If you have a disk or CD-ROM that came with this device, insert it now.
It is recommended that you let Windows search for an updated driver. To do this, click Next to continue.
< Back
Next >
Cancel

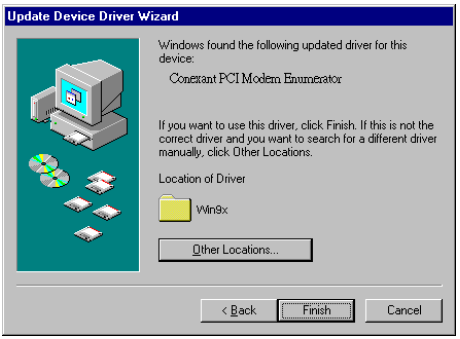
2. When Windows warns unable to locate a driver for this device, insert the provided CD into your CD-ROM drive and click **Other Locations**.


Update Device Driver Wizard
Windows was unable to locate a driver for this device.
If you do not want to install a driver now, click Finish. To search for a driver manually, click Other Locations. Or, to begin the automatic search again, click Back.
Other Locations...
< Back
Finish
Cancel

3. When **Select Other Location** message appears, click **Browse** to locate the path of driver's location: **x:\Driver\Win9x** (where x: represents your CD-ROM drive) and click **OK**.



4. Windows will find the driver file for the device. Click **Finish**.


Update Device Driver Wizard
Windows found the following updated driver for this device:
Conexant PCI Modem Enumerator
If you want to use this driver, click Finish. If this is not the correct driver and you want to search for a different driver manually, click Other Locations.
Location of Driver
Win9x
Other Locations...
< Back
Finish
Cancel

5. When prompted with **Insert Disk**, click **OK**.

6. In **Copying Files** window, click **Browse** to locate the path of driver's location: **x:\Driver\Win9x** (where x: represents your CD-ROM drive) and click **OK**.
7. When **New Hardware Found** message appears, wait for completing the installation.
8. If **Modem Region Select** window appears, select the country where the modem is to be used and then click **OK**.

3.2 Software Installation for Windows 98

1. After installing the modem card into your PC, power on your PC and start Windows 98. Your computer detects new hardware and displays the **Add New Hardware Wizard** window. Click **Next**.

Add New Hardware Wizard
This wizard searches for new drivers for:
PCI Communication Device
A device driver is a software program that makes a hardware device work.
< Back
Next >
Cancel

2. Select the **Search for the best driver for your device** option and click **Next**.

Add New Hardware Wizard
What do you want Windows to do?
Search for the best driver for your device. (Recommended).
Display a list of all the drivers in a specific location, so you can select the driver you want.
< Back
Next >
Cancel

3. Insert the provided CD into your CD-ROM drive. Select **Specify a location** and click **Browse** to locate the path of driver's location: **x:\Driver\Win9x** (where x: represents your CD-ROM drive). Then click **Next**.

Add New Hardware Wizard
Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected locations. Click Next to start the search.
Floppy disk drives
CD-ROM drive
Microsoft Windows Update
Specify a location:
D:\DriverWin9x
Browse...
< Back
Next >
Cancel

4. Windows will find the driver file for the device. Click **Next**.
5. Click **Finish**.

Add New Hardware Wizard
Conexant PCI Modem Enumerator
Windows has finished installing the software that your new hardware device requires.
< Back
Finish
Cancel

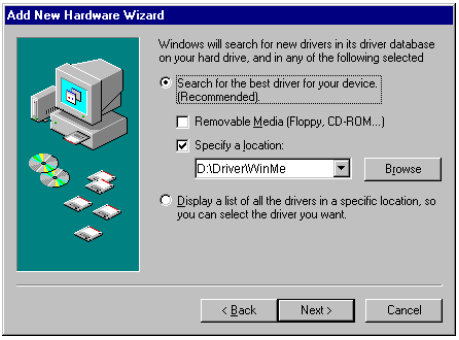
6. When **New Hardware Found** windows appear, wait for Windows to complete the installation.
7. If **Modem Region Select** window appears, select the country where the modem is to be used and then click **OK**.

3.3 Software Installation for Windows Me

1. After installing the modem card into your PC, power on your PC and start Windows Me. Your computer detects new hardware and displays the **Add New Hardware Wizard** window. Select the **Specify the location of the driver** option and click **Next**.

Add New Hardware Wizard
Windows has found the following new hardware:
PCI Communication Device
Windows can automatically search for and install software that supports your hardware. If your hardware came with installation media, insert it now and click Next.
What would you like to do?
Automatic search for a better driver (Recommended)
Specify the location of the driver (Advanced)
< Back
Next >
Cancel

2. Insert the provided CD into your CD-ROM drive. Select **Search for the best driver for your device** and then check **only** the **Specify a location** box. Click **Browse** to locate the path of driver's location: **x:\Driver\WinME** (where x: represents your CD-ROM drive) and click **Next**.


Add New Hardware Wizard
Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected
Search for the best driver for your device. (Recommended)
Removable Media (Floppy, CD-ROM...)
Specify a location:
D:\Driver\WinMe
Browse
Display a list of all the drivers in a specific location, so you can select the driver you want.
< Back
Next >
Cancel

3. When Windows finds the driver file for the device, click **Next**.

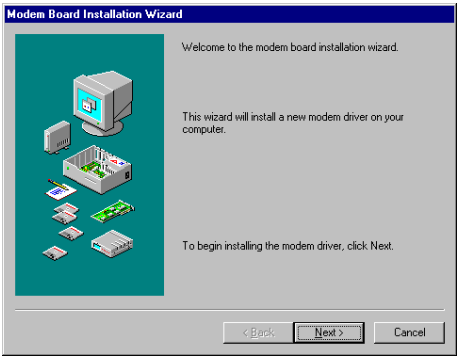
4. When the following window appears, click **Finish**.

5. When **New Hardware Found** windows appear, wait for Windows to complete the installation.

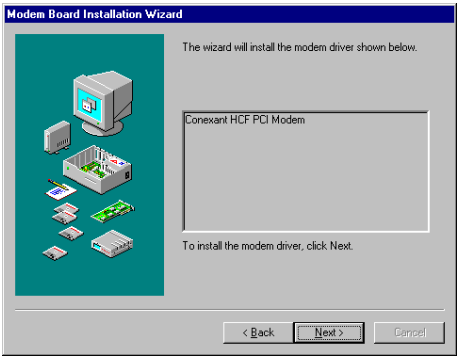
3.4 Software Installation for Windows NT

1. After installing the modem card into your PC, power on your PC and start Windows NT. Insert the provided CD into your CD-ROM drive. Click **Start** menu and then click **Run** to open the **Run** dialog box. Type **x:\Driver\NT40\setup.exe** (where x: represents your CD-ROM drive) in the **Open:** field and click **OK**.

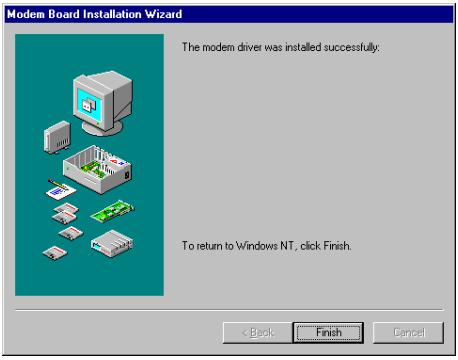
2. When **Modem Board Installation Wizard** appears, click **Next** to begin installing.


Modem Board Installation Wizard
Welcome to the modem board installation wizard.
This wizard will install a new modem driver on your computer.
To begin installing the modem driver, click Next.
< Back
Next >
Cancel

3. When Windows finds the driver file for the device, click **Next**.


Modem Board Installation Wizard
The wizard will install the modem driver shown below.
Conexant HCF PCI Modem
To install the modem driver, click Next.
< Back
Next >
Cancel

4. When **Modem Country Select** window appears, select the country where the modem is to be used and click **OK**.
5. When installation is complete, click **Finish**.



3.5 Software Installation for Windows 2000

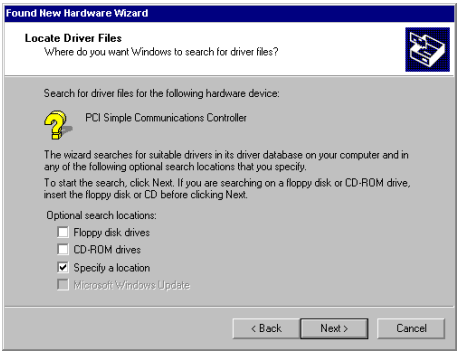
1. After installing the modem card, power on your PC and start Windows 2000. Your computer detects new hardware and displays the **Found New Hardware Wizard** window. Click **Next**.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
< Back
Next >
Cancel

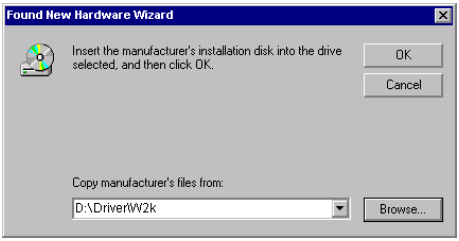
2. Select **Search for a suitable driver for my device** and click **next**.

Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
PCI Simple Communications Controller
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a specific driver
< Back
Next >
Cancel

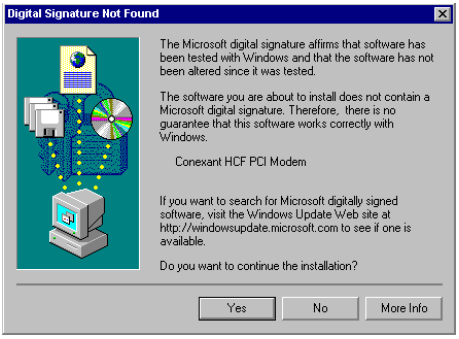
3. Check the **Specify a location** box and click **Next**.


Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
PCI Simple Communications Controller
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel

4. When the following window appears, insert the provided CD into your CD-ROM drive. Click **Browse** to locate the path of driver's location: **x:\Driver\W2K** (where x: represents your CD-ROM drive) and click **OK**.



5. When Windows finds the driver file for the device, click **Next**.
6. When **Digital Signature Not Found** window appears, click **Yes** to continue.


Digital Signature Not Found
The Microsoft digital signature affirms that software has been tested with Windows and that the software has not been altered since it was tested.
The software you are about to install does not contain a Microsoft digital signature. Therefore, there is no guarantee that this software works correctly with Windows.
Conexant HCF PCI Modem
If you want to search for Microsoft digitally signed software, visit the Windows Update Web site at http://windowsupdate.microsoft.com to see if one is available.
Do you want to continue the installation?
Yes
No
More Info

7. Click **Finish**.

Found New Hardware Wizard
Completing the Found New Hardware Wizard
Conexant HCF PCI Modem
Windows has finished installing the software for this device.
To close this wizard, click Finish.
< Back
Finish
Cancel

8. When **Found New Hardware** windows appear, wait for Windows to complete the installation.

Chapter 4 Configuring Countries

Before using the modem, you may need to specify the country where you locate upon different telecommunication regulations/ laws. If you have configured your country during the installation process, just ignore this section.

Follow the instructions below:

4.1 For Windows 95/98

1. Click **Start** menu, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **HCF Modem Region Select** icon.

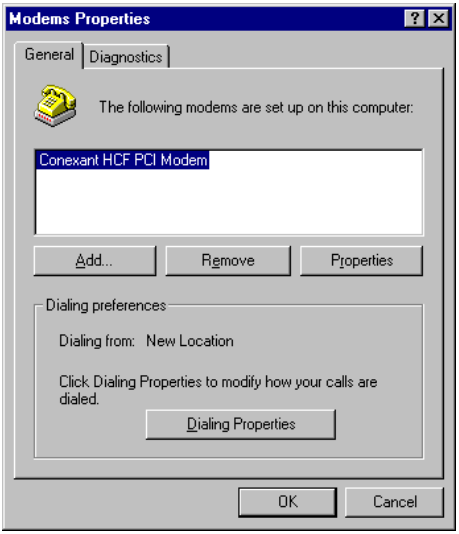
2. In **Modem Region Select** window, select a country where your modem is to be used and then click **OK**.

4.2 For Windows Me

1. Click **Start** menu, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **Modems** icon.

   If location information is not provided yet, the **Location Information** window will appear. Enter your area code and then click **Close**.

2. In the **General** tab under **Modems Properties** window, select **Conexant HCF PCI Modem** and click **Dialing Properties**.

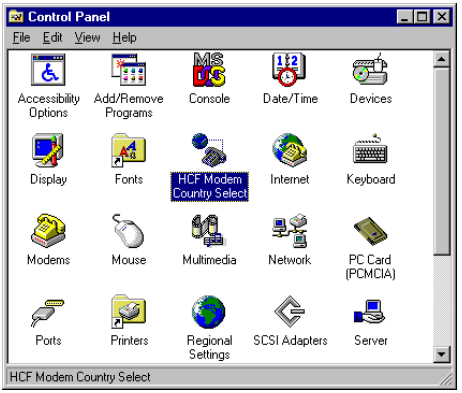


3. Click on the drop-down arrow of **I am in this country/region** and select the country where the modem is to be used. Click **OK**.

4.3 For Windows NT

During the installation process, you will be prompted to configure your country. If you need to change the configuration, follow the steps below.

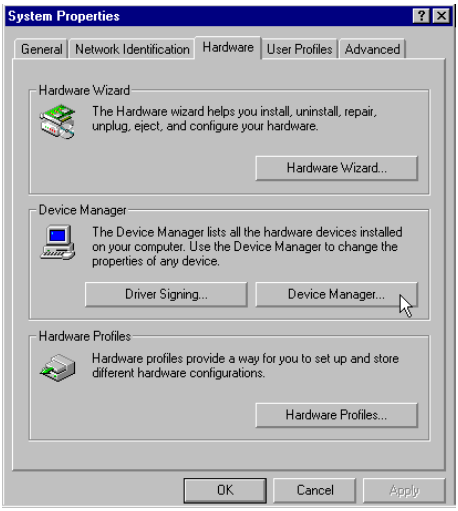
1. Click **Start** menu, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **HCF Modem Country Select** icon.



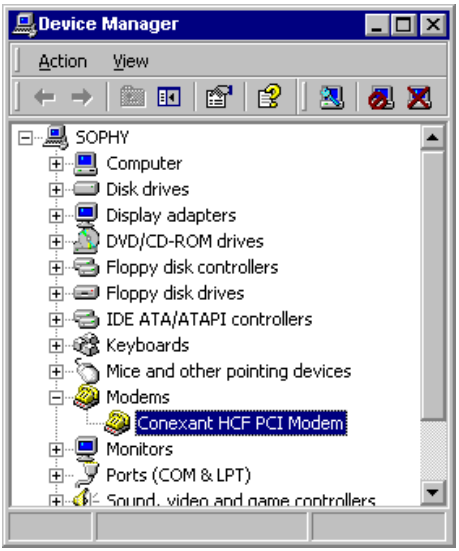
2. In **Modem Country Select** window, select the country where your modem is to be used and click **OK**.

4.4 For Windows 2000

1. Click **Start** menu, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **System** icon.
2. Click the **Hardware** tab. In **Device Manager** section, click on **Device Manger**.


System Properties
General
Network Identification
Hardware
User Profiles
Advanced
Hardware Wizard
The Hardware wizard helps you install, uninstall, repair, unplug, eject, and configure your hardware.
Hardware Wizard...
Device Manager
The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.
Driver Signing...
Device Manager...
Hardware Profiles
Hardware profiles provide a way for you to set up and store different hardware configurations.
Hardware Profiles...
OK
Cancel
Apply

3. In **Device Manager** window, double-click **Modems** and then **Conexant HCF PCI Modem**.



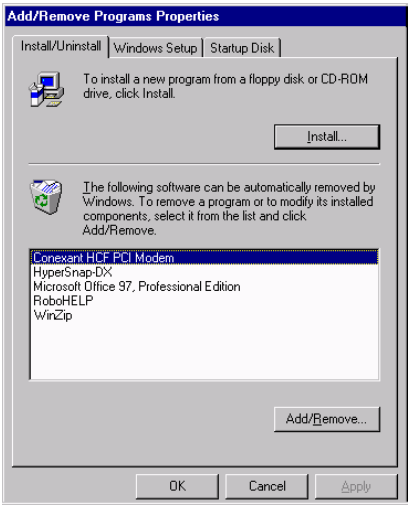
4. Click **Advanced** tab. In the **Country Select** section, click on the drop-down arrow to select a country where the modem is to be used. Click **OK**.

Chapter 5 Uninstalling the Software

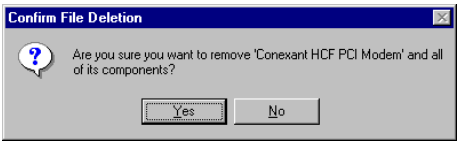
If you need to uninstall the software of PCI modem card from your system, please follow the steps below.

5.1 Uninstalling from Windows95/98

1. Click **Start**, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **Add/Remove Programs** icon.
2. When **Add/Remove Programs Properties** window appears, in the **Install/Uninstall** tab, select **Conexant HCF PCI Modem** from the list and click **Add/Remove**.


Add/Remove Programs Properties
Install/Uninstall
Windows Setup
Startup Disk
To install a new program from a floppy disk or CD-ROM drive, click Install.
Install...
The following software can be automatically removed by Windows. To remove a program or to modify its installed components, select it from the list and click Add/Remove.
Conexant HCF PCI Modem
HyperSnap-DX
Microsoft Office 97, Professional Edition
RoboHELP
WinZip
Add/Remove...
OK
Cancel
Apply

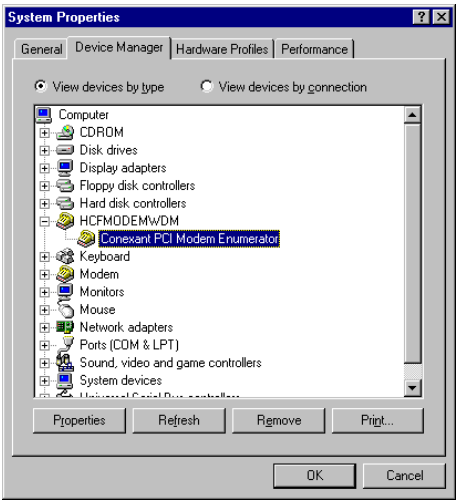
3. In **Confirm File Deletion** window, click **Yes** to remove the components.



4. When you return to the **Add/Remove Programs Properties** window, click **OK** to exit the window.
5. Manually restart your computer to remove all components completely.

5.2 Uninstalling from Windows Me

1. Click **Start**, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **System** icon.
2. In the **System Properties** window, click the **Device Manager** tab, double-click **HCFMODEMWDN** and then select **Conexant PCI Modem Enumerator**. Click **Remove**.



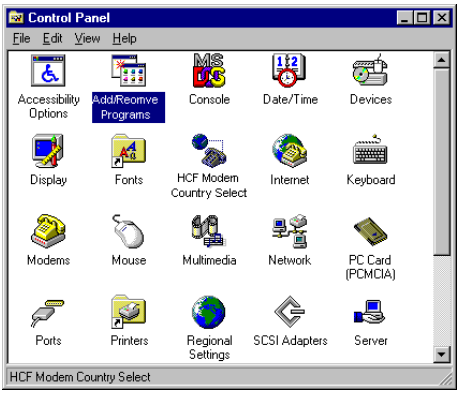
3. **Confirm Device Removal** message will appear. Click **OK** to remove the device.

Confirm Device Removal
Conexant PCI Modem Enumerator
Warning: You are about to remove this device from your system.
OK
Cancel

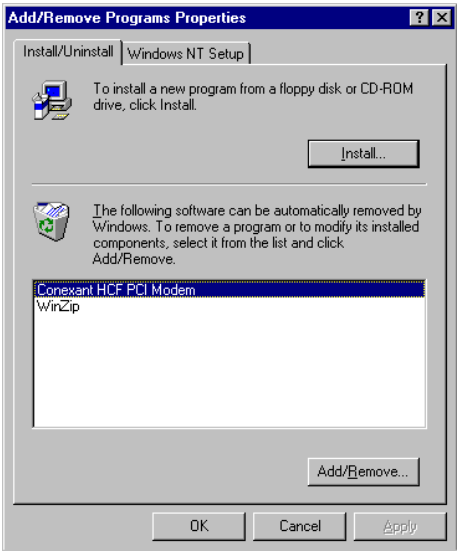
4. When back to **System Properties** window, click **Close** to return to Windows Me.

5.3 Uninstalling from Windows NT

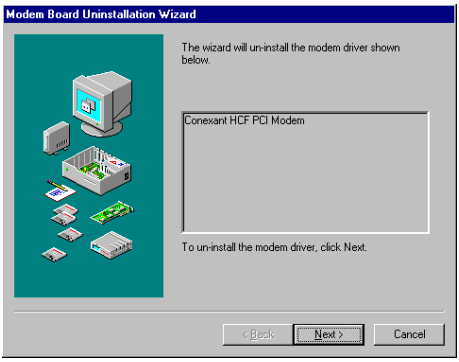
1. Click the **Start** menu, point to **Settings** and click **Control Panel**. Double click the **Add/Remove Programs** icon.



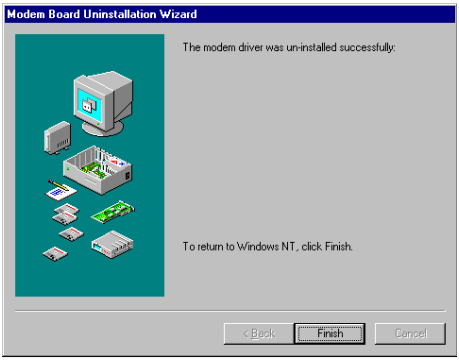
2. From the Install/Uninstall tab in the **Add/Remove Programs Properties** window, select **Conexant HCF PCI Modem** from the list and click **Add/Remove** button.


Add/Remove Programs Properties
Install/Uninstall
Windows NT Setup
To install a new program from a floppy disk or CD-ROM drive, click Install.
Install...
The following software can be automatically removed by Windows. To remove a program or to modify its installed components, select it from the list and click Add/Remove.
Conexant HCF PCI Modem
WinZip
Add/Remove...
OK
Cancel
Apply

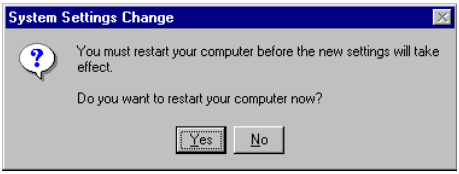
3. In **Modem Board Uninstallation Wizard** window, confirm the target driver **Conexant HCF PCI Modem** and click **Next** to uninstall the modem driver.


Modem Board Uninstallation Wizard
The wizard will un-install the modem driver shown below.
Conexant HCF PCI Modem
To un-install the modem driver, click Next.
< Back
Next >
Cancel

4. Click **Finish**.

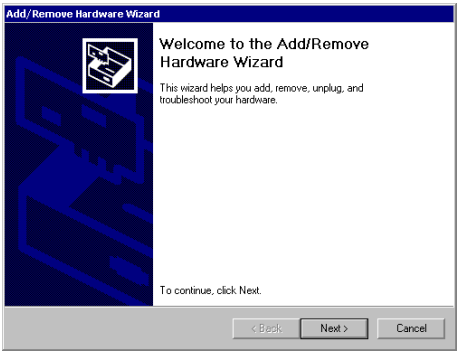


5. When prompted to restart your computer, click **Yes** to restart your computer.

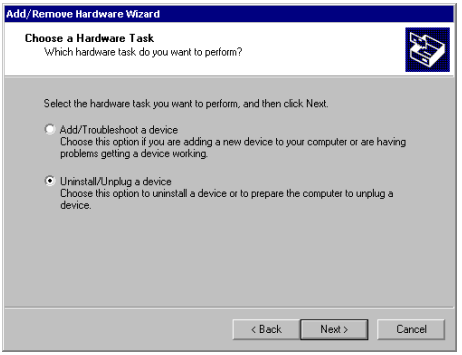

System Settings Change
You must restart your computer before the new settings will take effect.
Do you want to restart your computer now?
Yes
No

5.4 Uninstalling from Windows 2000

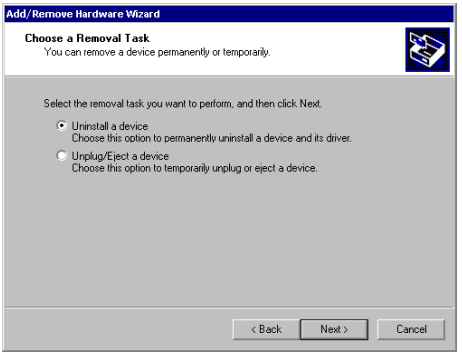
1. Click **Start** menu**,** point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **Add/Remove Hardware** icon. When **Add/Remove Hardware Wizard** window appears, click **Next**.


Add/Remove Hardware Wizard
Welcome to the Add/Remove Hardware Wizard
This wizard helps you add, remove, unplug, and troubleshoot your hardware.
To continue, click Next.
< Back
Next >
Cancel

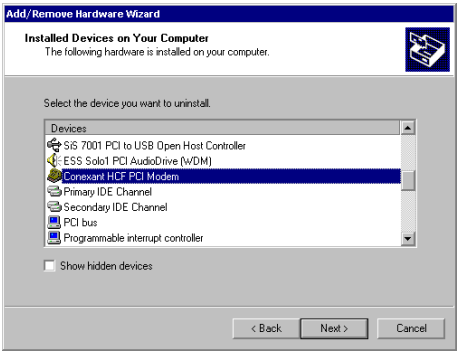
2. Select **Uninstall/Unplug a device** and click **Next**.


Add/Remove Hardware Wizard
Choose a Hardware Task
Which hardware task do you want to perform?
Select the hardware task you want to perform, and then click Next.
Add/Troubleshoot a device
Choose this option if you are adding a new device to your computer or are having problems getting a device working.
Uninstall/Unplug a device
Choose this option to uninstall a device or to prepare the computer to unplug a device.
< Back
Next >
Cancel

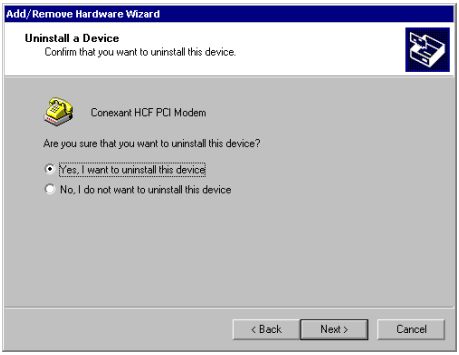
3. Select **Uninstall a device** and click **Next**.


Add/Remove Hardware Wizard
Choose a Removal Task
You can remove a device permanently or temporarily.
Select the removal task you want to perform, and then click Next.
Uninstall a device
Choose this option to permanently uninstall a device and its driver.
Unplug/Eject a device
Choose this option to temporarily unplug or eject a device.
< Back
Next >
Cancel

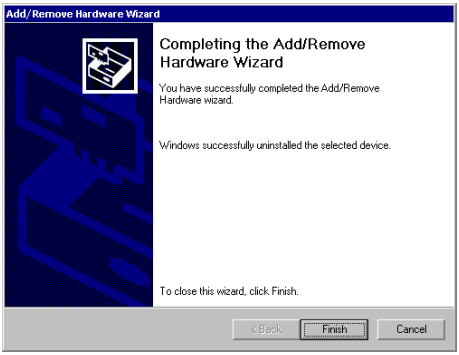
4. Select **Conexant HCF PCI Modem** and click **Next**.


Add/Remove Hardware Wizard
Installed Devices on Your Computer
The following hardware is installed on your computer.
Select the device you want to uninstall.
Devices
SiS 7001 PCI to USB Open Host Controller
ESS Solo1 PCI AudioDrive (WDM)
Conexant HCF PCI Modem
Primary IDE Channel
Secondary IDE Channel
PCI bus
Programmable interrupt controller
Show hidden devices
< Back
Next >
Cancel

5. Select **Yes, I want to uninstall this device** and click **Next**.


Add/Remove Hardware Wizard
Uninstall a Device
Confirm that you want to uninstall this device.
Conexant HCF PCI Modem
Are you sure that you want to uninstall this device?
Yes, I want to uninstall this device
No, I do not want to uninstall this device
< Back
Next >
Cancel

6. When the remove is complete, click **Finish**.


Add/Remove Hardware Wizard
Completing the Add/Remove Hardware Wizard
You have successfully completed the Add/Remove Hardware wizard.
Windows successfully uninstalled the selected device.
To close this wizard, click Finish.
< Back
Finish
Cancel

Chapter 6 Command Reference

If you are already familiar with the use of a modem and the Hayes AT command set, this modem will be extremely easy for you to use. Just read the installation procedures in the installation manual and you are ready to begin operation. If you are new to modem communications, we recommend that you read through this manual first. If you come across terms that you don't understand, consult the glossary. Words in boldface type are command names, commands, or default settings. Carriage returns (Enter) are noted with <CR> or [ENTER]; this does not mean to enter these characters literally; but instead to press the Enter key.

This chapter provides an alphabetized reference with examples for all commands for the modem. The system of commands is depicted below in the figure below.

To use these commands for dialing or configuring the modem, make sure the communications software package you will be using lets you operate the modem through its internal commands. If your software permits use of the modem's internal commands, read this chapter.

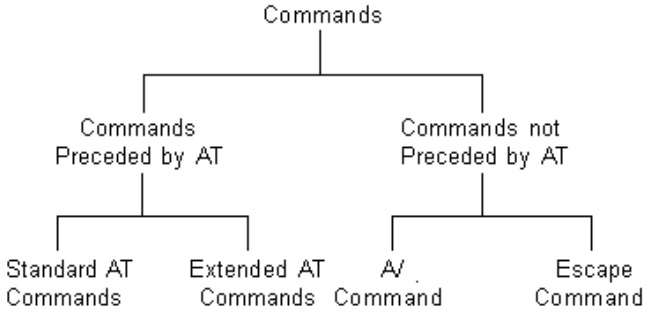


Figure 6-1 System of Commands

6.1 General Command Information

Except for the **A/** command and the +++ escape command, all commands must be prefixed with the attention code **AT**. For instance, the **A** command (below) would be entered as: "**AT A<CR>**". Without the AT prefix, the command line cannot be executed. Once entered, AT cannot be deleted with the **Backspace** or **Delete** key.

More than one command can be placed on a single line and, if desired, separated with spaces for readability. Once the carriage return (**Enter**) key is

pressed, the command line is executed. A line with no carriage return is ignored.

The modem accepts either upper or lower case characters in the command line and ignores any spaces within or between commands. Typing errors can be corrected with the **Backspace** key. Exceptions are noted in the description of specific commands.

6.2 AT Commands

A Go On-line in Answer Mode

This command instructs the modem to go off-hook immediately and then make a handshake with the remote modem. Handshaking is not available during leased line operation.

A is usually used to manually answer an incoming call or to switch from voice conversation to data communication.

D Go On-line in Originate Mode

D instructs the modem to go off-hook immediately and automatically dial the number contained in the dial string following **D**. The dial string may contain any of the dial modifiers contained in the following section. The **D** command without a dial string is usually used to switch from voice conversation to data communication or to call a remote modem in leased-line operation mode.

En Command Echo

E0/E	Disables command echo.
E1	Enables command echo.

Mn Monitor Speaker On/Off

M0/M	Speaker is always off.
M1	Speaker is off while receiving carrier.
M2	Speaker is always on.

Nn Automode Enable

N0	Automode detection is disabled.
N1	Automode detection is enabled.
On	Return to On-Line Data Mode
O0	Enters on-line data mode without a retrain. Handling is determined by the Call Establishment task. Generally, if a

connection exists, this command connects the DTE back to the remote modem after an escape (+++).

O1 Enters on-line data mode with a retrain before returning to on-line data mode.

P Set Pulse Dial as Default

Causes the modem to assume that all subsequent dial commands are pulse dials. You may omit the " P " from the dial strings.

Q Result Code Display

Determines whether the modem sends the result codes to the DTE.

Q0 Allows the modem to send result codes to the DTE.

Sn Reading and Writing to S Registers

Sn? Reads S Registers:Read the contents of the S register specified by 'n'.

Sn=x Writing to Registers:

Writes the value of x to the specified S register. All the registers will return the OK response if x is a legal value.

T Set Tone Dial as Default

Causes the modem to assume that all subsequent dial commands are tone dial.

Vn Select Word or Digit Result Codes

V0/V Displays result codes in digital format.

V1 Displays result codes in verbose format.

Wn Connect Message Control

This command controls the format of CONNECT messages. The parameter value, if valid, is written to **S31** bits 2 and 3. Note that the **Wn** command can be overridden by register **S95** bits (see **S95** description).

W0 Upon connection, the modem reports only the DTE speed (e.g., CONNECT 19200). Subsequent responses are disabled.

W1 Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed, respectively. Subsequent responses are disabled.

W2 Upon connection, the modem reports the DCE speed (e.g., CONNECT 14400). Subsequent responses are disabled.

Xn Extended Result Codes

This command selects which subset of the result messages will be used by the modem to inform the DTE of the results of commands.

Blind dialing is enabled or disabled by country parameters. If the user wishes to enforce dial tone detection, a "W" can be placed in the dial string (see D command). Note that the information below is based upon the default implementation of the X results table.

If the modem is in facsimile mode (+FCLASS=1), the only message sent to indicate a connection is CONNECT without a speed indication.

X0 Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE.

X1 Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX(XXXX=rate). Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not elected, NO CARRIER will be reported instead of NO DIAL TONE.

X2 Disables monitoring of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIAL TONE, NO ANSWER, and CONNECT XXXX. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO DIAL TONE will be reported instead of NO CARRIER.

X3 Enables monitoring of busy tones; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX. Blind dialing is enabled/disabled by country parameters. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported.

X4 Enables monitoring of busy tones; send all messages.

Zn Reset

Zn, which must be placed at the end of the command line, resets the active configuration of the modem to the stored configuration saved in nonvolatile RAM, hangs up the modem, and clears the command buffer.

Z0/Z Resets the modem and loads stored configuration 0.

6.2.1 Commands Preceded by &

&Cn Select DCD Options

&C0/&C Maintains an ON status for the Data Carrier Detect (DCD).

&C1 Uses the actual state of the carrier from the remote modem for DCD.

&Dn DTR Option

Determines actions taken by the modem in relation to the Data Terminal Ready (DTR) signal of the serial port.

&D0 DTR is ignored. Allows operation with DTEs that do not provide DTR.

&D1 DTR drop is interpreted by the modem as if the escape sequence has been entered. The modem returns to the command state without disconnecting.

&D2 DTR drop causes the modem to hang up. Auto answer is inhibited.

&F Fetch Factory Configuration

&F Recall factory profile.

&Gn Set Guard Tone

&G0 - G1 Disable guard tone.

&G2 Select 1800Hz-guard tone.

&Kn DTE/Modem Flow Control

Determines how the modem controls the flow of data between the local DTE and the modem. When the modem terminal buffer is nearly full, the modem will either send an XOFF or drop CTS to stop the data flow. When the buffer is nearly empty, the modem will either send an XON or raise CTS to start the data flow.

&K0 Disable DTE/DCE flow control.

&K3 Enable RTS/CTS DTE/DCE flow control.

&K4 Enables XON/XOFF DTE/DCE flow control.

&K5 Enables transparent XON/XOFF DTE/DCE flow control.

&K6 Enable RTS/CTS and XON/XOFF DTE/DCE flow control.

&Mn Communication Mode

(Same as &Q0)

&Pn Select Pulse Dialing Make/Break Ratio

&P0/&P Sets a 39/61 make/break ratio @ 10 pps - used in USA.

&P1 Sets a 33/67 make/break ratio @ 10 pps.

&P2 Sets a 39/61 make/break ratio @ 20 pps.

&P3 Sets a 33/67 make/break ratio @ 20 pps.

&Qn Asynchronous Mode Selection

This command is an extension of the &M command and is used to control the connection modes permitted.

&Q0 Select direct asynchronous operation.

&Q6 Select asynchronous operation in normal mode (speed buffering).

&Tn Testing and Diagnostics

Testing commands must be initiated in command mode (at the end of the command line) with asynchronous operation in the Direct mode, selected (&Q0) at a speed of 1200 bps or faster. A telco connection must be established prior to loopback tests. If these conditions are not met, an ERROR result code is issued. If a local analog loopback is initiated while the modem is connected, the modem disconnects before performing the test. A test remains active for the period of time specified in register S18. If S18 is zero, the test aborts when the user issues the &T0 command.

&T0/&T Terminates any test currently in progress.

&T1 Initiates a local analog loopback in accordance with ITU-T V.54, L3; verifies the path between the local DTE and the local modem.

&V View Configuration Profiles

&V Displays the active configuration profile.

&Wn Store the Current Configuration to Nonvolatile RAM

&W0 Writes the current active configuration to profile 0 in nonvolatile RAM.

6.2.2 Commands Preceded by \

\Nn Operation Mode Control

Selects the operating mode to be used during connection

\N0 Selects Normal (speed buffering) Mode. (Same as &Q6)

\N1	Selects Direct (pass-through) Mode. (Same as &Q0)
\N2	Selects Reliable Link Mode.
\N3	Selects Auto-reliable Mode. Modem attempts to connect with error correction.
\N4	Select LAPM error-correction mode.
\N5	Select MNP error-correction mode.

6.2.3 Commands Preceded by %

%C Enable/Disable Data Compression

Enables or disable data compression negotiation. The modem can only perform data compression on an error-corrected link.

%C0	Disables data compression.
%C1	Enables MNP 5 data compression negotiation.
%C2	Enables V.42 bis data compression.
%C3	Enables both V.42 bis and MNP 5 data compression.

Result Codes:

OK	n=0,1,2,or 3.
ERROR	Otherwise.

%En Enable/Disable Line Quality Monitor and Auto-Retrain or Fallback/Fall Forward

Control whether or not the modem will automatically monitor the line quality and request a retrain (**%E1**). If enable, the modem attempts to retrain for a maximum of 30 seconds.

%E0	Disable line quality monitor and auto-retrain.
%E1	Enable line quality monitor and auto-retrain.
ERROR	Otherwise.

6.3 Dial Modifiers

This section describes all of the dial modifiers, which are used in dial strings.

@ Answer

"@", placed after a phone number, this modifier tells the modem to wait for 5 seconds of silence before dialing the next number in the dial string. @ is usually used to access a secure computer system that provides a silent answer as permission for further entrance.

, Pause

"**,**", placed anywhere in the dial string, tells the modem to pause for the number of seconds specified by S-register S8 before processing the rest of the dial string.

! Initiate a Hookflash

"**!**", placed anywhere in the dial string, tells the modem to initiate a hookflash, which means to hang up for 0.5 seconds and then go off-hook again before processing the rest of the dial string. This modifier allows access to PBX features like call transferring.

; Return to Command State after Dialing

"**;**", which must be placed at the end of the dial string, returns to the command state after dialing the number placed ahead of it. A long telephone number would overflow the 40-character command buffer if placed all in one command line, so it must be broken into two or more command lines. Each part includes part of the number, and all but the last command line end with the "**;**" followed by a carriage return.

^ Tone Control

Toggles calling tone enable/disable: applicable to current dial attempt only.

L Re-dial Last Number

The modem will re-dial the last valid telephone number. The **L** must be immediately after the **D** with all the following characters ignored.

P Pulse Dialing

P, placed ahead of a number, tells the modem to dial a number using pulse dialing.

T Touchtone Dialing

T, placed ahead of a number, tells the modem to dial a number using touchtone dialing.

W Wait for Dialtone

W, placed after a number, tells the modem to wait up to 30 seconds to detect a one-second continuous dialtone before dialing the next number. **W** is most often used in a PBX system to wait for the dialtone of an outside telephone line.

6.4 Commands Not Preceded by AT

Two commands, A/ and +++, are neither preceded by the attention code **AT** nor followed by a carriage return.

A/ Repeat Command

A/ repeats the execution of the last command line stored in the command buffer. If the last command line is invalid, the ERROR result code will appear on the screen. Note that **A/** cannot be preceded by **AT**; if it is, ERROR will appear on the screen.

+++ Escape

+++ followed by AT <CR> allows the modem to escape from the data mode to the on-line command state (command state without breaking the established connection.)

To escape, stop transmitting data, wait at least one escape guard time (the default time is one second), and then enter three consecutive escape characters (the default character is +) followed by AT <CR>.

The modem will return to the command state and send the **OK** result code to the screen. Note that the escape command is the only command that can be recognized by the modem in the one-line state; it cannot be recognized in the command state.

6.5 Result Codes

The modem sends a response to the user via the screen after a command is issued. As shown in the figure below, there are two forms for each result code: Modem Response code and digit code.

Modem Response	Digit	Description
OK	0	Command executed without errors
CONNECT	1	Connect to another modem
RING	2	Detect an incoming ring
NO CARRIER	3	Carrier lost or never detected
ERROR	4	Invalid command or invalid character
CONNECT 1200	5	Connection established at 1200 bps
NO DIALTONE	6	Dial tone not detected within timeout
BUSY	7	Detected a busy tone after dialing
NO ANSWER	8	No ringback or quiet answer was detected by the modem
CONNECT 2400	10	Connection established at 2400 bps
CONNECT 4800	11	Connection established at 4800 bps
CONNECT 9600	12	Connection established at 9600 bps

CONNECT 7200	13	Connection established at 7200 bps
CONNECT 12000	14	Connection established at 12000 bps
CONNECT 14400	15	Connection established at 14400 bps
CONNECT 19200	16	Connection established at 19200 bps
CONNECT 38400	17	Connection established at 38400 bps
CONNECT 57600	18	Connection established at 57600 bps
CONNECT 115200	19	Connection established at 115200 bps
DELAYED	24	Call fails to connect and number dialed is considered 'delayed' due to country blacklisting requirements
FAX	33	A fax modem connection is established in a facsimile mode
DATA	35	A data modem connection is established in a facsimile mode
CARRIER 300	40	Carrier detected
CARRIER 1200TX/75RX V.23	44	Carrier detected
CARRIER 75RX/1200TX V.23	45	Carrier detected
CARRIER 1200	46	Carrier detected
CARRIER 2400	47	Carrier detected
CARRIER 4800	48	When the 4800 bps data rate in V.32 bis or V.32 mode has been detected on the line
CARRIER 7200	49	When the 7200 bps data rate in V.32 bis mode has been detected on the line
CARRIER 9600	50	When the 9600 bps data rate in V.32 bis or V.32 mode has beendetected on the line
CARRIER 12000	51	When the 12000 bps data rate in V.32 bis mode has been detected on the line
CARRIER 14400	52	When the 14400 bps data rate in V.32 bis mode has been detected on the line
CARRIER 16800	53	When the 16800 bps data rate in V.34 mode has been detected on the line

Modem Response	Digit	Description
CARRIER 19200	54	When the 19200 bps data rate in V.34 mode has been detected on the line
CARRIER 21600	55	When the 21600 bps data rate in V.34 mode has been detected on the line
CARRIER 24000	56	When the 24000 bps data rate in V.34 mode has been detected on the line
CARRIER 26400	57	When the 26400 bps data rate in V.34 mode has been detected on the line
CARRIER 28800	58	When the 28800 bps data rate in V.34 mode has been detected on the line
CONNECT 16800	59	Connection established at 16800 bps
CONNECT 21600	61	Connection established at 21600 bps
CONNECT 24000	62	Connection established at 24000 bps
CONNECT 26400	63	Connection established at 26400 bps
CONNECT 28800	64	Connection established at 28800 bps
COMPRESSION CLASS 5	66	MNP class 5 compression in use
COMPRESSION V.42BIS	67	V.42 bis compression in use
COMPRESSION NONE	69	No compression is being used
PROTOCOL:NONE	76	Normal mode selected
PROTOCOL:LAPM	77	LAPM mode selected
CARRIER 31200	78	When the 31200 bps data rate in V.34 mode has been detected on the line
CARRIER 33600	79	When the 33600 bps data rate in V.34 mode has been detected on the line
PROTOCOL:ALT	80	
PROTOCOL:ALT-CELLULAR	81	
CONNECT 33600	84	Connection established at 33600 bps
CONNECT 31200	91	Connection established at 31200 bps
CARRIER 32000	150	Connection established at 32000 bps

Modem Response	Digit	Description
CARRIER 34000	151	Connection established at 34000 bps
CARRIER 36000	152	Connection established at 36000 bps
CARRIER 38000	153	Connection established at 38000 bps
CARRIER 40000	154	Connection established at 40000 bps
CARRIER 42000	155	Connection established at 42000 bps
CARRIER 44000	156	Connection established at 44000 bps
CARRIER 46000	157	Connection established at 46000 bps
CARRIER 48000	158	Connection established at 48000 bps
CARRIER 50000	159	Connection established at 50000 bps
CARRIER 52000	160	Connection established at 52000 bps
CARRIER 54000	161	Connection established at 54000 bps
CARRIER 56000	162	Connection established at 56000 bps
CONNECT 32000	165	Connection established at 32000 bps
CONNECT 34000	166	Connection established at 34000 bps
CONNECT 36000	167	Connection established at 36000 bps
CONNECT 38000	168	Connection established at 38000 bps
CONNECT 40000	169	Connection established at 40000 bps
CONNECT 42000	170	Connection established at 42000 bps
CONNECT 44000	171	Connection established at 44000 bps
CONNECT 46000	172	Connection established at 46000 bps
CONNECT 48000	173	Connection established at 48000 bps
CONNECT 50000	174	Connection established at 50000 bps

Modem Response	Digit	Description
CONNECT 52000	175	Connection established at 52000 bps
CONNECT 54000	176	Connection established at 54000 bps
CONNECT 56000	177	Connection established at 56000 bps
+FCERROR	+F4	

** V.90 Result Codes

Speed	Carrier	Connect
28000	180	180
29333	181	181
30667	182	182
32000	150	165
33333	183	183
34667	184	184
36000	152	167
37333	185	185
38667	186	186
40000	154	169
41333	187	187
42337	188	171
45333	189	189
46667	190	190
48000	158	173
49333	191	191
50667	192	192
52000	160	175
53333	193	193
54667	194	194
56000	162	177

Chapter 7 S Register Reference

Your modem has status registers. These registers are memory locations inside your modem which control your modem's operation. You usually do not have to worry about setting any register because the default values work for most applications.

7.1 Register Summary

The following chart summarizes your modem's registers:

Reg.#	Range	Unit	Default Dec	Default Hex	Description
S0	0 - 255	rings	0	00h	Number of rings before auto-answer.
S1	0 - 255	rings	0	00h	Ring count.
S2	0 - 255	ASCII	43	2Bh	Escape character code.
S3	0 - 127	ASCII	13	0Dh	Command terminator (<CR>character).
S4	0 – 127	ASCII	10	0Ah	Line feed character.
S5	0 - 255	ASCII	8	08h	Backspace character.
S6	2 - 255	seconds	2	02h	Wait time for blind dialing.
S7	1 - 255	seconds	50*	32h	Wait time for carrier after dial.
S8	0 - 255	seconds	2*	02h	Pause time for comma (dial delay).
S9	1 - 255	1/10 sec.	6*	06h	Carrier detect response time.
S10	1 - 255	1/10 sec.	14*	0Eh	Lost carrier to hang-up delay.
S11	50 - 255	1/1000 sec.	95	5Fh	DTMF Tone Duration.
S14	[Bit Mapped Options]*		138	8Ah	
S18	0 - 255	seconds	0*	00h	Test mode timer.
S21	[Bit Mapped Options]		4*	04h	V.24/General bit-mapped options.
S22	[Bit Mapped Options]		117*	75h	Speaker/Results Bit-mapped options.
S23	[Bit Mapped Options]		54	36h	
S24	0 - 255	seconds	0	00h	Sleep Inactivity Timer.
S25	0 - 255	seconds	5*	05h	Dalay to DTR.
S26	0 - 255	1/100 sec	1*	01h	RTS to CTS Delay Interval.
S28	[Bit Mapped Options]		0*	00h	
S29	0 - 255	10 ms	70*	46h	Flash Dial Modifier Time.
S30	0 - 255	10 s	0*	00h	Inactivity Disconnect Timer.
S31	[Bit Mapped Options]		194*	C2h	
S32	0 - 255	ASCII	17	11h	XON Character.
S33	0 - 255	ASCII	19	13h	XOFF Character.
S37			0*	00h	Desired Line Connection Speed.
S38	0 - 255	seconds	20*	14h	Delay before Forced-Disconnect.

S39		3	03h	Flow Control.
S46		138*	8Ah	Protocol Selection.
S95	[Bit mapped]		0*	00h Extended result codes.

7.2 Glossary of S Registers

S0 Number of Rings Before Auto Answer

S0 determines the number of rings that must be received before the modem automatically answers an incoming call. For example, when **S0=3**, the modem automatically answers after the third ring. When **S0=0**, the modem does not automatically answer an incoming call; it stays on-hook until the **A** command is issued manually to answer the incoming call.

Range: 0 - 255 rings

S1 Ring Count

S1 automatically increments its value by one each time the modem receives a ring while in the command state. **S1** is reset to zero if no ring is detected within **8** seconds.

Range: 0 - 255 rings

S2 ASCII Value of Escape Character

S2 stores the ASCII value of the escape character. Setting register **S2** to a value greater than 127 disables the escape command and you cannot return to the command state. With escape disabled, in the on-line state the modem cannot hang up until the power is turned off or the remote modem hangs up.

Range: 0 - 255, ASCII decimal.

S3 ASCII Value of Carriage Return

S3 stores the ASCII value of the carriage return character. (Pertains to asynchronous operation only.)

Range: 0 - 127, ASCII decimal.

S4 ASCII Value of Line Feed Character

S4 stores the ASCII value of the line feed character, if your computer does not recognize the default as a line feed, change the value. A value greater than 127 disables the line feed. When disabled, the line feed character that precedes or follows a result code is canceled.(Pertains to asynchronous operation only.)

Range: 0 - 127, ASCII decimal.

S5 ASCII Value of Backspace Character

S5 stores the ASCII value of the backspace character. The backspace is used to edit a command line. If your computer does not recognize the default as a backspace, change the value. (Pertains to asynchronous operation only.)

Set **S5** to any value from 0 to 31 or 127. Do not set it to any value from 32 through 126 because these values correspond to printable ASCII characters. A value greater than 127 disable the backspace and makes it impossible to edit a command line.

Range: 0 - 32, ASCII decimal.

S6 Wait Time before Blind Dialing

S6 controls how long the modem waits after it goes off-hook before it dials the first digit of the telephone number. The modem always pauses for at least 2 seconds, even if **S6** is set to less than two seconds.

Range: 2 - 255 seconds.

S7 Wait for Carrier after Dial

S7 controls how long the modem waits for a carrier signal from a remote modem after originating a call or from the calling modem after going off-hook when answering a call.

S7 also controls how long the modem waits for a one-second continuous dialtone after dialing a number followed by the **W** dial modifier. If the modem detects a one-second continuous dialtone within the specified wait time, it proceeds to dial.

Range: 1 - 255 seconds.

S8 Pause Time for Comma

S8 controls how long the modem pauses when a comma "**,** " is encountered in a dial string while executing a dial command.

Range: 0 - 255 seconds.

S9 Carrier Detect Response Time

S9 determines how long a carrier signal must be present for the modem to confirm it. The longer the response time, the easier it is for the modem to correctly recognize a carrier without mistaking other signals or transient noise on the line as a carrier.

Range: 1 - 255 tenths of a second.

S10 Delay between Loss of Carrier and Hang-Up

S10 determines the delay time between the loss of a carrier from the remote modem and hang-up. This allows for a temporary loss of carrier without causing the local modem to disconnect. When **S10** is set to 255, the modem functions as if a carrier is always present.

The actual interval the modem waits before disconnecting is the value in **S10** minus the value in **S9**. Therefore, the value in **S10** must be greater than that in **S9**, or else the modem disconnects before it recognizes the carrier.

Range: 1 - 255 tenths of a second.

S11 DTMF (Touch-tone) Tone Duration

S11 determines the duration and spacing of tones for Dual Tone Multifrequency (DTMF) dialing. This value has no effect on pulse dialing.

Range: 50 - 255 milliseconds.

S14 Bit Mapped Options

Bit	Value	Description
bit 1 (E)	0	Disabled.
	1	Enabled.
bit 2 (Q)	0	Disabled.
	1	Enabled.
bit 3 (V)	0	Numeric.
	1	Verbose.
bit 4		Reserved
bit 5 (P or T)	0	T (Tone dial).
	1	P (Pulse dial).
bit 6		Reserved
bit 7	0	Answer mode.
	1	Originate mode.

S18 Test Timer

The test timer determines how long tests are performed. The modem automatically ends the test when the test time is expired. The default value of 000 disables the test timer. When the timer is thus disabled, all tests must be ended with the &T0 command.

Range: 0 - 255 seconds.

S21 V.24/General Bit Mapped Options

Bit	Value	Description
bit 3,4	00	**&D0.**
	01	**&D1**.
	10	**&D2**.
bit 5	0	**&C0**.
	1	**&C1**.

S22 SPEAKER/Results Bit Mapped Options

Bit	Value	Description
bit 0,1	00	Select **L0**.
	01	Select **L1**.
	10	Select **L2**.
	11	Select **L3**.
bit 2,3	00	Select **M0**.
	01	Select **M1**.
	10	Select **M2**.
	11	Select **M3**.
bit 4,5,6	000	Select **X0**.
	001	Reserved.
	010	Reserved.
	011	Reserved.
	100	Select **X1**.
	101	Select **X2**.
	110	Select **X3**.
	111	Select **X4**
bit 7	[RESERVED]	

S23 Bit Mapped Options

Bit	Value	Description
bit 1,2,3	000	Communications rate = 300 bps.
	001	Communications rate = 600 bps.
	010	Communications rate = 1200 bps.
	011	Communications rate = 2400 bps.
	100	Communications rate = 4800 bps.
	101	Communications rate = 9600 bps.
	110	Communications rate = 19200 bps.
	111	Communications rate = 38400 bps or higher.
bit 4,5	00	Even parity selected.

	01	Not used.
	10	Odd.
	11	None.
bit 6,7	00	**&G0**.
	01	**&G1**.
	10	1800Hz. (**&G2**)

S24 Sleep Inactivity Timer

Set the length of time, in units of 10 seconds, that the modem will operate in normal mode with no detected telephone line of DTE line activity before entering low-power sleep mode.

Range: 0 - 255 (seconds)

S25 Delay to DTR

S25 serves two purposes. When the modem is operating in synchronous mode 1, the value assigned to **S25** specifies the length of time the modem waits after a connection has been made before examining DTR. This allows the modem to ignore an ON-to-OFF transition of DTR, giving the user time to disconnect the modem from the asynchronous terminal and attach it to a synchronous terminal, without forcing the modem back to the asynchronous command mode. During this time, the value for **S25** is read in whole seconds.

In all other modes, and after call establishment in synchronous modes 1 and 4, the value is read in 1/100 seconds. In any mode, a change in DTR (ON or OFF) that persists for a period shorter than the value held in **S25** is ignored by the modem while it is in data mode.

Range: 0 - 255 (1 second for synchronous mode 1;0.01 second otherwise)

S26 RTS to CTS Delay Interval

Pertains to synchronous operation only. When CTS tracks RTS and the modem detects an ON-to-OFF transition on RTS, this register sets the time delay before the modem turns CTS to ON.

Range: 0 - 255 hundredths of a second

S28 Bit Mapped Option Status

bit 0, 1 Reserved.

bit 2 Reserved.

bit 3, 4 Pulse dialing (**&Pn**).

0 = 39%-61% make/break ratio at 10 pulse per second (**&P0**).

1 = 33%-67% make/break ratio at 10 pulse per second (**&P1**).

2 = 39%-61% make/break ratio at 20 pulse per second (**&P2**).

3 = 33%-67% make/break ratio at 20 pulse per second (**&P3**).

bit 5 Reserved.

S29 Flash Dial Modifier Time

Range: 0 - 255 10ms intervals

S30 Inactivity Disconnect Timer

This register determines the length of time, in seconds, the modem waits before disconnecting when no data is sent or received. This only operates in **&Q6** modes, a value of 0 in this register disables the timer.

Range: 0 - 255 tenths of a second

S31 Bit Mapped Options

Bit	Value	Description
bit 1		Controls auto line speed detection (**Nn**).
	0	Disable (**N0**).
	1	Enable (**N1**).
bit 2, 3		Controls error correction progress messages (**Wn**).
	00	DTE speed only (**W0**).
	01	Full reporting (**W1**).
	10	DCE speed only (**W2**).

S32 XON Character

Range: 0 - 255, ASCII decimal

S33 XOFF Character

Range: 0 - 255, ASCII decimal

S37 Desired Line Connection Speed

Bit	Value/Description
bit 0-4	Desired line connection speed. This is interlinked with the Fn command. If an invalid number is entered, the number is accepted into the register, but **S37** will act as if the default value has been entered. 0 = Attempt auto mode connection. 1-3 = Attempt to connect at 300 bps. 4 = Reserved. 5 = Attempt to connect at V.22 1200 bps.

6 = Attempt to connect at V.22bis 2400 bps.
7 = Attempt to connect at V.23.
8 = Attempt to connect at V.32 bis/V.32 4800 bps.
9 = Attempt to connect at V.32 bis/V.32 9600 bps.
10 = Attempt to connect at V.32 bis 12000 bps.
11 = Attempt to connect at V.32 bis 14400 bps.
12 = Attempt to connect at V.32 bis 7200 bps.

bit 5-7 Reserved.

S38 Delay Before Forced-Disconnect

This register controls how long the modem waits, after receiving the **ATH** command or loss of DTR, before it disconnects from the telephone line. When connected in an error-corrected mode, you can use this register to ensure that all data is transmitted from the modem's buffer before the modem disconnects.

If you set **S38** between 0 and 254, the modem waits that number of seconds for the remote modem to acknowledge all data before it disconnects. If you set **S38** to 255, the modem waits indefinitely for the remote modem to acknowledge all data.

Range: 0 - 255 seconds

S39 Flow Control

Bit	Value	Connect speed
bit 0-2	000	No flow control.
	011	RTS/CTS **&K3.**
	100	XON/XOFF **&K4**.
	101	Transparent XON **&K5**.
	110	Both Method **&K6**.
bit 3-7	Reserved.	

S46 Protocol Selection

This register controls whether the modem tries to use data compression when the modem establishes an error corrected link. The default is for the modem to use data compression (138).

Value	Description
136	Execute error correction protocol with no compression.
138	Execute error correction protocol with compression.

S95 Extended Result Codes

This register can override some of the **W** command options. Set the appropriate bit to 1 to enable the corresponding result code, regardless of the **W** command setting Set the bit to 0 to disable the result code.

Bit	Description
0	CONNECT indicates DCE speed.
1	Append /ARQ to the CONNECT result code if the protocols is other than NONE.
2	CARRIER result code.
3	PROTOCOL: result code.
4	Reserved.
5	COMPRESSION: result code.
6	Reserved.
7	Reserved.

Chapter 8 Testing

The modem provides “local analog loop back ” testing feature to identify fault location when transmission quality is not good.

8.1 Local Analog Loopback

The local analog loopback test checks the integrity of the local computer or terminal and the local modem. During the test, the local modem internally loops data sent from the local computer or terminal back to the same computer or terminal as shown in Figure 8-1. During the test, data is not transmitted to the remote modem.

If characters are looped correctly during this test, both the modem and the local computer or terminal are functioning correctly. If incorrect characters appear on the screen, either the local computer or terminal or the local modem is in error.

To perform a local analog loopback, put the local modem in the command state. If it is on-line, issue the escape command + + +, to return to the command state.

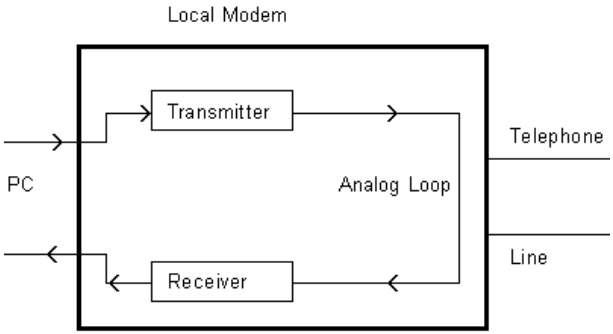


Figure 8-1 Data Path for Local Analog Loopback

Example 1 - Test Timer Disabled

Command	**AT&Q0**<CR>
	ATS18=0&T1 <CR>
Result:	**CONNECT 31200**
Test message:	**THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 1234567890**
Escape:	+ + +
	(return to the on-line command state)

Result code:	**OK**
Command:	**AT&T0** <CR> (end the test)
Result code:	**OK**

Here, the test timer is disabled and the modem sets up an internal analog loop as shown in Figure 8-1. When the loopback is established, the modem goes on-line and the test message (any character you type) is looped back on the screen for verification. Finally, +++ returns the modem to the command state and **&T0** ends the test and breaks the internal analog loop.

The following command sequence is the same as the previous one except that the test timer is set to 60 seconds. At the end of the test time, the timer expires, the test ends, and the test result is reported.

Example 2 - Test Timer Enabled

Command:	**AT&Q0**<CR>
	ATS18=60&T1<CR>
Result:	**CONNECT 31200**
Test message:	**THE QUICK BROWN FOX JUMPS OVER**
	THE LAZY DOG 1234567890
Escape:	**+++**
Result code:	**OK**

Chapter 9 Troubleshooting

This chapter describes common problems in the installation, configuration and regular usage of your Fax/Data Modem. To test the Fax/Data Modem, a communication software package is needed and the package must include a mode that allows you to operate your Fax/Data Modem by directly issuing internal commands to the modem.

Follow the procedures in the following sections to resolve these common problems:

No Response From Your Modem

1. If you are using the internal add-on card modems, make sure that the COM port address you have set your modem to corresponds to the appropriate selection in the communications software which you are using.
2. Issue the **ATZ** command to reset your modem. The returned result code should be "0" or "OK" depending on what communications program you are using. Your modem is OK if you get one of these responses. If there is no response after issuing the **ATZ**<CR>, continue to the next step.
3. Check if there are any other interface cards in your computer that use the same COM port address as your modem. If so, you must set your modem to another COM port address. (Keep in mind that on most systems, only two COM ports are available. One of them must be used as either 1 or 3, while the other must be used as 2 or 4.) For example, if a mouse is set to COM 1, your modem should be set to COM2 or COM4. Continue to the next step if the COM port address is OK.
4. Issue the command: **AT&F&W** <CR>, if a "0" or "OK" result code is displayed on the screen, your modem is OK. Otherwise, contact your dealer for assistance.

Your Modem Does Not Dial Out

Make sure that your modem responds normally as described in section 8.1. If you can communicate through the keyboard, check whether the modem is properly connected to the phone line.

Your Modem Does Not Connect After It Has Dialed a Phone Number

The problem may have several causes. The phone line may be too noisy or the telephone cord may be poor. Try the line with a regular phone. Also the remote modem may not recognize your modem's baud rate.

You Can't Transmit After You Have Connected to the Remote Modem

In this case, check the communication parameters of the remote modem, then configure your software to the same number of data bits, stop bits, and parity.

Appendix A Caller ID Commands

+VCIDn - Caller ID (Enables or disables Caller ID.)(for U.S.A)

This command only apply to models which support the Caller ID function.

+VCID=0 Disables Caller ID.

+VCID=1 Enables Caller ID with formatted presentation to the DTE. The modem will present the data items in a <Tag><Value> pair format. The expected pairs are data, time, caller code (telephone number), and name.

+VCID=2 Enables Caller ID with unformatted presentation to the DTE. The modem will present the entire packet of information, excluding the leading U's, in ASCII printable hex numbers.

Result Codes:

OK n=0 or 2.

ERROR Otherwise.

Inquiries :

+VCID? Retrieves the current Caller ID mode from the modem.

+VCID=? Returns the mode capabilities of the modem in a list with each element separated by commas.

Formatted Form Reporting

The modem presents the data in the <tag>=<value> pair format as described in the table below. Spaces are present on both sides of the equal sign.

TAG	Description
DATE	DATE=MMDD where MM is the month number(01 to 12) and DD is the day number (01..31).
TIME	TIME=HHMM where HH is the hour number (00 to 23) and MM is the minute number (00 to 59).
NMBR	NMBR=<number> or P or O where <number> is the telephone number of the caller, where P indicates that the calling number information is not available since the originating caller has requested private service, and where O indicates that the calling number information is not available or out of service at the calling location.
NAME	NAME=<listing name> where <listing name> is the subscription name.
MESG	MESG=<data tag><length of message><data><checksum> in printable ASII hex numbers. This tag indicates a

data item not listed above. The message is only possible for Multiple Message Format.

Notes:

1. The modem does not present any Caller ID information if the DCE detects a checksum error in the Caller ID packet.
2. In the event of an unrecognized data tag, the modem will present the data in ASCII hex numbers following the MESG tag.

Example of Formatted Form Reporting

1. The following example illustrates the standard Caller ID message packet.

   RING
   DATE = 0321
   TIME = 1405
   NMBR = 504551234
   NAME = A N OTHER
   RING
   RING

2. The following example illustrates the case where the tag of the packet is not recognized by the modem.

   RING
   MESG = 06034242431
   RING
   RING

Unformatted Form Reporting

The modem presents all information and packet control information found in the message. The modem, however, excludes the leading U's (channel seizure information) from the presentation. The packet is presented in ASCII printable hex numbers, the modem does not insert spaces, or line feeds, for formatting between bytes or words of the packet. The modem does not detect the checksum of the packet.

Example of Unformatted From Reporting

RING
0412303332323234303539313435353132333435
RING
RING

Appendix B Technical Specifications

Function Requirement

Communication

- **Data**
  * Protocols : V.90, V.34, V.32bis, V.32, V.23, V.22bis, V.22, V.21, Bell212A and Bell103
  * Error Correction : V.42, MNP2-4
  * Data Compression : V.42bis, MNP5
  * Command set : Enhanced TIA/EIA-602 command set
  * DTE Speed : 300 to 115200 bps
  * Data Format : 10 bits, including start bit, stop bit and parity
- **Fax**
  * Protocols : V.17, V.29, V.27ter, V.21 ch 2
  * Fax type : Group 3 compatible
  * Command set : TIA/EIA-578 class 1 Fax command set
- **Diagnostics Capabilities**
  * Analog loopback
  * Remote digital loopback and remote digital loopback selftest
- **Modem Operational Characteristics Under FCC Spec.**
  * Transmit Level : less than -9 dBm
  * Receive sensitivity : -30 dBm +/- 2 dBm Under V.34 mode
  * Guard Tone : 550 or 1800 Hz +/- 20 Hz
  * Answer Tone : CCITT 2100 Hz +/- 15 Hz
  * Bell 2225 Hz +/- 10 Hz
  * Dialing Method Under ***FCC***:
    1) Tone dialing
       (A) Symbols : 1 2 3 4 5 6 7 8 9 0 # *
       (B) Frequency : within +/- 1.5%
       (C) High Group Level : < 0 dBm
       (D) Low Group Level : < 0 dBm
    2) Pulse dialing

(A) Duration : 10 pps +/- 1 pps

(B) M/B ration : 39 +/- 10%

* Call Progress Tone Detection :

340Hz ~ 640 Hz @ 0 dBm ~ -38 dBm

* Ring detection :

15.3Hz~68Hz, 40Vrms~150Vrms, 2 sec ON/ 4 sec OFF

* Modem bit error rates : error less than 10E-5 at nominal SNR

* Power consumption :

1) Sleep mode : 50mW @ +3.3VDC +/- 5%

2) Idle mode : 500mW @ +3.3VDC +/- 5 %

3) Connection mode : 800mW @ +3.3DC +/- 10 %

- **Operating Systems**

* Windows 95

* Windows 98

* Windows ME

* Windows 2000

* Windows NT 4.0

- **Compatibility Requirements**

The modem must reliably connect to popular data modems and fax machines.

- **Customer requirements**

* Auto dial and auto answer

Interface Specification

- **DTE interface**

The modem provides PCI bus as following definition.

*PCI Interface

- **Telephone Network Interface**

*The DIP type jack for telephone.

Product Reliability

The calculated MTBF shall be greater than 50000 hours. The calculation shall be made under following assumptions :

Ambient Temperature : 40 degree C, inlet air temperature

Operating Environment

* Operating temperature : 0 to 70 degree C
* Shipping and storage temperature : -40 to 65 degree C
* Operating Humidity : 8% to 80% none-condensing
* Altitude : 0 to 10000 feet

Mechanical Characteristics

- **Dimensions**

  The modem assembly consists of one 2 layer PCB assembly. The modem is approximately 125mm x 64mm.

- **Assembly**

  The polymeric materials used in the modem assembly meet of exceed the requirement of UL 94.

Regulatory standards compliance

The product must compliance with all the following regulatory standards :

* CSA
* DOC
* FCC part 15 and FCC part 68
* JATE/VCCI

Appendix C Quick Reference

A	Go On-line in Answer Mode
D	Go On-line in Originate Mode
En	Command Echo
Mn	Monitor Speaker On/Off
Nn	Automode Enable
On	Return to On-line Data Mode
P	Set Pulse Dial as Default
Q	Result Code Display
Sn	Reading and Writing to S Registers
T	Set Tone Dial as Default
Vn	Select Word or Digit Result Codes
Wn	Connect Message Control
Xn	Extended Result Codes
Zn	Reset
&Cn	Select DCD Options
&Dn	DTR Option
&F	Fetch Factory Configuration
&Gn	Set Guard Tone
&Kn	DTE/Modem Flow Control
&Mn	Communication Mode
&Pn	Select Pulse Dialing Make/Break Ratio
&Qn	Asynchronous Mode Selection
&Tn	Testing and Diagnostics
&V	View Configuration Profiles
&Wn	Store the Current Configuration to Nonvolatile RAM
\Nn	Operating Mode Control
%Cn	Enable/Disable Data Compression
%En	Enable/Disable Line Quality Monitor and Auto-Retrain
@	Answer
,	Pause
!	Initiate a Hookflash
;	Return to Command State after Dialing

^	Tone Control
L	Re-dial Last Number
P	Pulse Dialing
T	Touchtone Dialing
W	Wait for Dialtone
A/	Repeat Command
+++	Escape

Appendix D Glossary

ASCII - An acronym for American Standard Code for Information Exchange. ASCII is a seven-bit code which defines 128 standard characters, including control characters, letters, numbers, and symbols. An extra 128 characters comprise the extended ASCII set.

Baud Rate - The transmission rate between two serial devices, e.g., modems, fax machines, etc. Measured in Bits Per Second.

Blind Dialing - In blind dialing, the modem continues to dial, regardless of the existence of a dialtone, ring, or busy signal.

BPS - Bits Per Second; the number of bits that can be transmitted in one second.

Carrier Signal - The analog data signal that a modem sends over telephphone wires.

COMx - Where (x = 1, 2, 3, or 4), COMx is the name(address) of serial communications ports on personal computers. Each serial port in a personal computer has a different number.

CTS - Clear To Send.

Default - The assumed value that is used for a command parameter when no other value is explicitly provided.

DCD - Data Carrier Detect.

DCE - Data Communication Equipment.

DTE - Data Terminal Equipment.

DTMF - Dual Tone Multifrequency(for touchtone dialing).

DTR - Data Terminal Ready.

FSK - Frequency Shift Keying.

Make/Break Ratio - The ratio of the off-hook (make) to on-hook (break) interval is the make/break ratio in pulse dialing.

Modem - A combination of the words MOdulator and DEModulator. Modems transform digital data into analog signals and back again.

Nonvolatile Memory - An area of memory inside the modem where the default configuration profile is stored. Values recorded in this memory will not be lost when the power is turned off.

Off-Hook - The condition when the modem has picked up the telephone line.

Off-Line Command State - A modem state in which the modem accepts, interprets and executes commands from an asynchronous computer or terminal.

On-Hook - The condition when the modem has not picked up the telephone line; the telephone is hung up.

On-Line - A carrier signal link with a remote modem has been established; communication is in progress.

On-Line State - A modem state in which the modem is connected with a remote modem. Data can be sent or received from the remote modem in this state. No commands will be accepted from the modem except the escape command which will bring the modem into the on-line command state.

On-Line Command State - A modem state in which the modem can accept or execute commands from an asynchronous computer or terminal while remaining connected with the remote modem. The user can return the modem to the on-line state by issuing the **ATOn** command or put it into the off-line command state by issuing command such as **ATZ** or **ATH**.

Parity - An error-checking method by which the modem verifies that the data just sent is correct.

pps - Pulse per second.

Profile - A list of default settings.

Protocol - A technical specification for serial communications.

PSK - Phase Shift Keying.

Pulse Dialing - A dialing form in which each digit is represented by a series of pulses. Rotary telephones all use pulse dialing.

QAM - Quadrature Amplitude Modulation.

Result Codes - The response the modem returns to the screen upon executing a command.

RAM - Random Access Memory.

ROM - Read-Only Memory. A chip inside the modem which stores the factory default settings. This memory cannot be changed.

RTS - Request To Send.

RX - Reception.

S Register - RAM locations in the modem which store the active configuration.

Serial Port - See COMx.

TCM - Trellis-Coded Modulation.

Touchtone Dialing - A dialing format in which each digit is represented by a musical frequency.

TX - Transmission.

Appendix E ASCII Code Table

Decimal	Hex	Value	Decimal	Hex	Value	Decimal	Hex	Value	Decimal	Hex	Value
000	00	NUL	032	20	(space)	064	40	@	096	60	'
001	01	SOH	033	21	!	065	41	A	097	61	a
002	02	STX	034	22	"	066	42	B	098	62	b
003	03	ETX	035	23	#	067	43	C	099	63	c
004	04	EOT	036	24	$	068	44	D	100	64	d
005	05	ENQ	037	25	%	069	45	E	101	65	e
006	06	ACK	038	26	&	070	46	F	102	66	f
007	07	BEL	039	27	'	071	47	G	103	67	g
008	08	BS	040	28	(	072	48	H	104	68	h
009	09	HT	041	29	)	073	49	I	105	69	i
010	0A	LF	042	2A	*	074	4A	J	106	6A	j
011	0B	VT	043	2B	+	075	4B	K	107	6B	k
012	0C	FF	044	2C	,	076	4C	L	108	6C	l
013	0D	CR	045	2D	-	077	4D	M	109	6D	m
014	0E	SO	046	2E	.	078	4E	N	110	6E	n
015	0F	SI	047	2F	/	079	4F	O	111	6F	o
016	10	DLE	048	30	0	080	50	P	112	70	p
017	11	DC1	049	31	1	081	51	Q	113	71	q
018	12	DC2	050	32	2	082	52	R	114	72	r
019	13	DC3	051	33	3	083	53	S	115	73	s
020	14	DC4	052	34	4	084	54	T	116	74	t
021	15	NAK	053	35	5	085	55	U	117	75	u
022	16	SYN	054	36	6	086	56	V	118	76	v
023	17	ETB	055	37	7	087	57	W	119	77	w
024	18	CAN	056	38	8	088	58	X	120	78	x
025	19	EM	057	39	9	089	59	Y	121	79	y
026	1A	SUB	058	3A	:	090	5A	Z	122	7A	z
027	1B	ESC	059	3B	;	091	5B	[	123	7B	{
028	1C	FS	060	3C	<	092	5C	\	124	7C	|
029	1D	GS	061	3D	=	093	5D	]	125	7D	}
030	1E	RS	062	3E	>	094	5E	^	126	7E	~
031	1F	US	063	3F	?	095	5F	_	127	7F	■

Appendix F FCC Regulations

FCC General Information

The Federal Communications Commission (FCC) of the United States restricts specific uses of modems, and places registration responsibilities on both the manufacturer and the individual user:

1. The modem may not be connected to a party line or to a coin operated telephone.
2. The modem manufacturer must make any repairs to the modem to maintain valid FCC registration.
3. Notification to the telephone company is no longer required prior to connecting registered equipment, but upon request from the telephone company, the user shall tell the telephone company which line the equipment is connected to as well as the registration number and ringer equivalence number of the registered protective circuitry. FCC information is printed on a label on the bottom of the modem.

FCC Notice

This equipment has been tested and found to comply with the limits for a digital device, pursuant to Subpart B of Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and uses radio frequency energy and if not installed and used the instructions, may cause interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Shielded interconnect cables and a shielded power cord must be employed with this equipment to insure compliance with the pertinent RF emission limits governing this device. Changes or modifications not expressly

approved by the manufacturer could void the user's authority to operate this equipment.

NOTE: The manufacturer is not responsible for any radio or T.V. interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.